WHAT IS CLAIMED IS:

1. A pressure control system having an inflow unit for admitting pressurized air into a cabin of an aircraft and for regulating the air pressure within the cabin, comprising:

an outflow unit including a motor for operating a valve for controllably discharging the pressurized air from the cabin at a specified rate, the outflow unit receiving a motor control signal that sets the speed of the motor in a forward or reverse direction to incrementally open or close the valve at a corresponding valve speed, the valve assuming a corresponding valve position to discharge air from the cabin at the specified rate;

an air pressure sensor disposed within the cabin for determining a cabin pressure level signal representing the air pressure within the cabin; and

a control unit for receiving the cabin pressure level signal and computing a cabin pressure level rate of change signal, for computing a commanded pressure level signal and a commanded pressure level rate of change signal, for comparing the cabin pressure level rate of change signal with the commanded pressure level rate of change signal to determine a cabin pressure rate of change error signal, for generating the motor control signal based on the cabin pressure rate of change error signal,

wherein the outflow unit, the air pressure sensor, and the control unit are coupled together to form a feedback control loop having an operating point, the operating point of the feedback control loop being determined independently from the motor speed, the valve speed, and the valve position feedback.

2. The pressure control system of Claim 1,

wherein the feedback control loop includes all electrical components.

3. The pressure control system of Claim 1, further comprising

a user interface unit for receiving commands from a user and for outputting a user command signal to determine one of a manual and an automatic operation of the pressure control system.

4. The pressure control system of Claim 1, wherein the outflow unit further comprises:

an outflow valve assembly including a duct being defined by a bore and a cross-sectional area, the bore being substantially parallel to the long axis of the duct and can be closed by a circular plate attached to an outflow valve rotating member disposed across a cross-sectional diameter of the bore comprising a butterfly outflow valve assembly, the butterfly outflow valve assembly being opened when the outflow valve rotating member rotates in a first direction to a point up to and including where the cross-sectional area of the bore being obstructed by the circular plate profile is minimum, the butterfly outflow valve being closed when the butterfly outflow valve rotating member rotates in a second direction to a point up to and including where the cross-sectional area of the bore being obstructed by the circular plate profile is maximum; and

a rotary electromechanical actuator for operating the butterfly outflow valve rotating member in the first direction and second direction,

wherein the outflow unit rotary electromechanical actuator receives a motor control signal for alternatively opening and closing the outflow valve so as to enable discharging the pressurized air at a predetermined rate.

5. The pressure control system of Claim 4,

wherein the rotary electromechanical actuator includes a second electric motor for operating the outflow valve.

6. The pressure control system of Claim 5,

wherein one of the electric motor and the second electric motor is a brushed direct-current (DC) so that the one of the electric motor and the second electric motor self commutates.

7. The pressure control system of Claim 5,

wherein one of the electric motor and the second electric motor is an alternating-current (AC) motor and includes a capacitor disposed to electrically connect the motor windings so that the one of the electric motor and the second electric motor self-commutates.

8. The pressure control system of Claim 1, wherein the control unit comprises:

an automatic control channel for determining the command pressure level signal automatically based on mode logic and environmental parameters; and

a manual control channel for manually operating the outflow unit according to user commands received by the user interface unit.

9. A pressure control system for regulating the air pressure within a cabin of an aircraft, comprising:

an inflow unit for supplying pressurized air into a cabin;

an outflow unit including a motor for operating a valve for controllably discharging the pressurized air from the cabin at a specified rate, the outflow unit receiving a motor control signal that sets the speed of the motor in a forward or reverse direction to incrementally open or close the valve at a corresponding valve speed, the valve assuming a corresponding valve position to discharge air from the cabin at the specified rate;

a first air pressure sensor disposed within the cabin for determining a cabin pressure level signal representing the air pressure within the cabin;

a second air pressure sensor disposed outside the cabin for determining an ambient pressure level signal representing the air pressure outside the cabin;

a user interface unit for receiving commands from a user and for outputting a user command signal to determine one of a manual and an automatic operation of the pressure control system; and

a control unit for receiving the cabin pressure level signal and computing a cabin pressure level rate of change signal, for receiving the ambient pressure level signal, the user command signal, and an aircraft inputs signal for computing a commanded pressure level signal and a commanded pressure level rate of change

signal, the control unit for comparing the cabin pressure level rate of change signal with the commanded pressure level rate of change signal to determine a cabin pressure rate of change error signal, for generating the motor control signal based on the cabin pressure rate of change error signal,

wherein the outflow unit, the air pressure sensor, and the control unit are coupled together to form a feedback control loop having an operating point, the operating point of the feedback control loop being determined independently from the motor speed, the valve speed, and the valve position feedback.

10. The pressure control system of Claim 9,

wherein the feedback control loop includes all electrical components.

11. The pressure control system of Claim 9, the control unit including:

a mode logic unit for receiving the aircraft inputs signal, the ambient pressure level signal, the user command signal and computing a commanded pressure level signal based on aircraft operating conditions in reference to a cabin pressurization protocol.

12. The pressure control system of Claim 9, wherein the control unit further comprises:

a sensor filter unit for receiving the cabin pressure level signal and outputting a filtered cabin pressure level signal;

a rate unit for receiving the filtered cabin pressure level signal and producing a sensed cabin pressure change rate;

a pressure command unit for receiving the filtered cabin pressure level signal, the sensed cabin pressure change rate signal, and a commanded pressure level signal and producing a pressure command signal;

a pneumatic compensation unit for receiving the pressure command signal and producing a pneumatic gain signal; and

a motor voltage unit for receiving the pneumatic gain signal and producing the outflow control signal.

13. The pressure control system of Claim 12, the rate unit further comprising:

a rate amplifier unit for receiving a filtered cabin pressure level signal and produces an amplified filtered cabin pressure level signal;

an analog to digital conversion unit for receiving the filtered cabin pressure level signal and outputting a digitized pressure level signal; and

a scaling unit for receiving the digitized pressure level signal and producing a sensed cabin pressure change rate signal.

14. The pressure control system of Claim 12, wherein the pressure command unit further comprises:

an analog to digital conversion unit for receiving a filtered cabin pressure level signal and producing a digital filtered cabin pressure level signal;

a scaling unit for receiving the digital filtered cabin pressure level signal and producing a scaled filtered cabin pressure level signal;

a first summing unit for subtracting the scaled filtered cabin pressure level signal from the commanded pressure level signal to produce a cabin pressure error signal;

a compensation unit for receiving the cabin pressure error signal and producing a compensated cabin pressure error signal;

a rate limiter unit for receiving the compensated cabin pressure error signal and producing a rate limited compensated cabin pressure error signal;

an electronic DP rate command unit for producing an electronic DP rate command signal; and

a second summing unit for adding the rate limited compensated cabin pressure error signal to the electronic DP rate command signal and subtracting the sensed cabin pressure change rate signal to produce a pressure command signal.

15. The pressure control system of Claim 12, wherein the pneumatic compensation unit further comprises:

a pneumatic gain unit for producing a pneumatic gain signal;

a gain multiplier unit receiving the pneumatic gain signal and the pressure command signal and producing a gain multiplier signal;

a gain compensation unit for receiving the gain multiplier signal and producing a compensated gain multiplier signal; and

a gain scaling unit for receiving the compensated gain multiplier signal and producing a pneumatic compensation signal.

16. The pressure control system of Claim 12, wherein the motor voltage unit further comprises:

a digital to analog conversion unit for receiving the pneumatic compensation signal and producing an analog pneumatic signal;

a power conditioning unit for producing a voltage supply signal; and

a pulse width modulation unit for receiving the analog pneumatic signal and the voltage supply signal and producing a pulse width modulation signal.

17. A method of controlling air pressure within a cabin that includes an inflow unit for supplying pressurized air to the cabin, the method comprising:

sensing the air pressure within a cabin to produce a cabin pressure level signal representing the air pressure within the cabin;

computing a cabin pressure level rate of change signal from the cabin pressure level signal;

sensing the air pressure outside the cabin to produce an ambient pressure level signal representing the air pressure outside the cabin;

receiving an aircraft inputs signal indicating an aircraft operating condition, a user command signal indicating an operational mode, and the ambient pressure level signal;

computing a commanded pressure level signal based on the aircraft inputs signal, the user command signal, and the ambient pressure level signal;

computing a commanded pressure level rate of change signal from the commanded pressure level signal;

comparing the cabin pressure level rate of change signal with the commanded pressure level rate of change signal to determine a cabin pressure rate of change error signal; and

outputting an outflow control signal to controllably discharge pressurized air from the cabin based on the cabin pressure rate of change error signal.

18. The method of Claim 17,

wherein the cabin pressure level rate of change signal is determined by sampling every 5 milliseconds.

19. The method of Claim 17,

wherein the commanded pressure level rate of change signal is determined by sampling every 50 milliseconds.

20. The method of Claim 17,

wherein the cabin pressure rate of change error signal is determined by sampling every 5 milliseconds.